

## READY TO EAT SALADS AN ANALYSIS OF HEALTH AND SAFETY CONDITIONS

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**ABSTRACT:** Fifty ready to eat salads bought in markets in La Plata (Argentina) have been microbiologically analyzed. It has been found that 88 % had an average of 540 cfu/g faecal coliform bacteria, 64 % had *Escherichia coli*. No isolation of *E. coli* O:157H:7 was achieved. On the other hand there was only one isolation of *Listeria monocytogenes* type 4 (2 %). Therefore 88 % of fresh cut salad did not meet the health and safety conditions required for human consumption.

**Key Words:** *Listeria*, *Escherichia coli*, ready to eat salads.

### ENSALADAS LISTAS PARA CONSUMO. ANÁLISIS DE CONDICIONES DE HIGIENE Y SEGURIDAD

**RESUMEN:** Cincuenta ensaladas listas para consumo compradas en mercados de La Plata (Argentina) fueron analizadas microbiológicamente. Se ha encontrado que el 88% tenían un promedio de 540 ufc/g de bacterias coliformes fecales, 64 % tenían *Escherichia coli*. Ningún aislamiento de *E. coli* O:157H:7 fue logrado. Por otro lado sólo se logró un aislamiento de *Listeria monocytogenes* tipo 4 (2 %). Por consiguiente, el 88% de las ensaladas cortadas frescas no se encontró en condiciones de higiene y seguridad requeridas para el consumo humano.

**Palabras clave:** *Listeria*, *Escherichia coli*, ensaladas lista para consumo.

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## INTRODUCTION

During recent years there has been an increasing emphasis on the importance of the consumption of fresh vegetables for the healthy diet. This type of food can be dangerous to consumers health if safety measures are not strictly complied with at the time of preparation. In these cases, contamination can be caused by animal manure and contaminated irrigation water. Several authors make reference to the presence of bacteria (*E. coli*, *Listeria monocytogenes*) and illness outbreak have been associated to the consumption of raw vegetables such as cabbage, lettuce, tomato, etc. (1, 2, 3, 4, 5, 6, 7, 8, 9, 10).

The symptom of the disease range from a mild flu-like illness to severe septicaemia, diarrhoea, hemorrhagic syndrome, particularly in children and immunosuppressed; infection during pregnancy can result in abortion, stillbirth or birth of a severely affected baby (*Listeria*).

Considering the particularities of this food (ready to eat products) that is dedicated to their consumption without a washing or later cooking a microbiological analysis has been carried out to determine the conditions of aptitude of these products.

It has been found in that the whole population (not only children, elderly people, pregnant women, and people with immunology problems) are consumers of this type of foods and they don't wash it because the own label (in general) indicate that it is ready to eat.

## MATERIAL AND METHODS

Several types of salads ready to eat in the original recipients were subject to microbiological analysis.

Fifty salads of different types were bought randomly in duly authorized markets paying special attention to the good state of their wrappings. Fifty four per cent of the products (27 out of 50) were labelled and elaboration date was specified. Forty six per cent (23 out of 50) showed no information at all. Sixty per cent (30 out of 50) were displayed in refrigerators. None of the recipients had "best before" recommendations.

Three samples of 25 g denominated A, B, and C were taken from each salad. Sample A was homogenized in culture broth with tryptone (0.1 %) and sodium chloride (0.85 %) (12) in a 1/100 dilution and it was inoculated for the Most Probable

Number (MPN) method for faecal coliform bacteria count. Sample B was used for *Escherichia coli* investigation (spp. and O:157H:7) according to Association of Official Analytical Chemists (AOAC) (13). Sample C was used to determine the presence of *Listeria monocytogenes*. Briefly, the primary enrichment was inoculated in Bleb (Buffered *Listeria* enrichment broth-Oxoid), the secondary one was also inoculated in Bleb. Finally both were inoculated in PALCAM (Oxoid). After colony identification, biochemical procedures were carried out. The serological procedures were carried out in Instituto Nacional de Enfermedades Infecciosas "Dr. Carlos G. Malbran" (INEI/ANLIS), using commercial antisera for serotype 1 and 4 (French Pasteur Institute).

## RESULTS

Faecal coliform bacteria findings are shown in Table 1. Eighty eight per cent of the analyzed products (44 out of 50) were positive. The average was 540 cfu/g, including the six negative samples. Eighteen per cent of the samples (9 out of 50) showed extreme values (>2400 cfu/g).

*E. coli* was isolated from 34 out of 50 products (68 %). All the inoculated colonies fermented the sorbitol in Mc. Conkey sorbitol solid culture (Britania) therefore the absence of *E. coli* O:157 H:7 was assumed.

Only one strain (2 %) developed characteristics of the genus *Listeria* in Palcam agar. This strain showed motility at 22 °C, was positive to esculin bile, developed in 6,5 % NaCl and fermented Kigler culture as expected. CAMP test result was identical to that of *Listeria monocytogenes* 4b ATCC 19115. Serological test characterized the isolated strain as type 4.

## DISCUSSION

This study show that 88 % of the products analyzed (44 out of 50) did not meet the health and safety conditions to be considered suitable for consumption, owing to the faecal coliform bacteria found. In the case of genus *Listeria* bacteria findings are different from those shown by Monge *et al* (1999); they found that 32 % of the products contaminated with *Listeria* spp. and 8 % with *L. monocytogenes*. On the other hand, 44 % of fresh cut and prepared salad vegetables in the Netherlands were positive (14) whereas in our study only 2 % of the salads (1 out of 50) were contaminated with *L. monocytogenes*.

Ready to eat salads expended in La Plata

Table 1: Most Probable Number findings for faecal coliform bacteria in different kinds of salads.

Tabla 1: Número más probable hallado de bacterias coliformes fecales en diferentes tipos de ensaladas

Trademark	Elaboration date	Refrigerated	MPN/g faecal coliform bacteria	Amount of salads
Yes	Yes	No	>2400 cfu/g	6
No	No	Yes	>2400 cfu/g	3
Yes	Yes	Yes	From 1100 to 240 cfu/g	6
No	No	Yes	From < 240 to 4 cfu/g	20
Yes	Yes	No	From < 240 to 4 cfu/g	9
Yes	Yes	Yes	Negative	6

markets have shown that microbiological control, application of Hazard Analysis Critical Control Point (HACCP) systems, and the education of people involved in the preparation and selling of the products are of major importance since such products are consumed without undergoing any kind of processing. In addition to these approach, increasing attention to sanitation, hygiene and the application of Hazard Analysis Critical Control Point (HACCP) procedures during manufacturing practices should help to reduce the risk of health to eat salads.

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